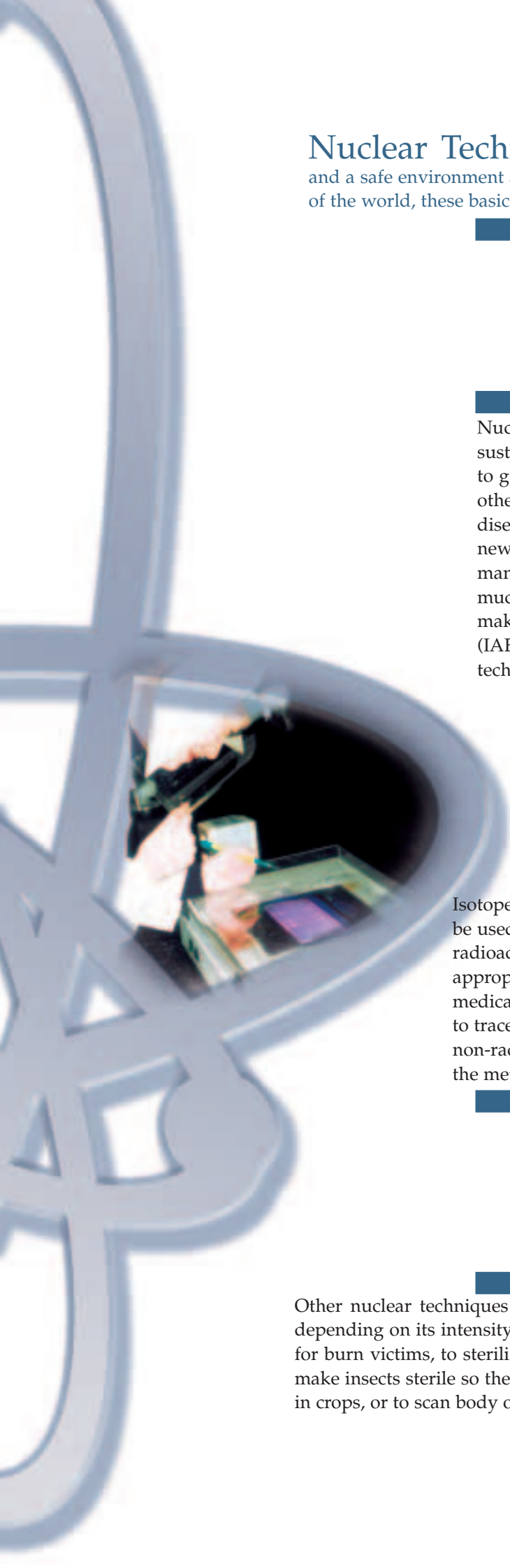




Building a Sustainable Future



INTERNATIONAL
ATOMIC ENERGY AGENCY



Nuclear Technology ■ Good health, sufficient food and water, and a safe environment are fundamental to our quality of life. Yet in many parts of the world, these basic needs remain beyond the reach of far too many people.

Nuclear technology offers unique tools in the quest for sustainable development. Such technology is often the best to gather information and provide solutions that would not otherwise be possible or practical: to diagnose and treat disease, to breed better crops and fight insect pests; to assess new sources of fresh water; and to monitor pollution. While many may only think of energy, nuclear technology has a much larger role to play in human development. Where it can make a difference, the International Atomic Energy Agency (IAEA) provides support to 134 Member States for using this technology to solve the important challenges they face.

Isotopes, stable and radioactive forms of chemical elements, can be used to “label” materials under study. Since both stable and radioactive isotopes can be identified and measured using appropriate equipment, labelling is often used in diagnostic medical tests, in studies of underground sources of water, and to trace pollutants, such as heavy metals and pesticides. Stable, non-radioactive, isotopes are used in nutritional studies to trace the metabolism of vitamins and trace minerals in supplements.


Other nuclear techniques use radiation which can be focussed into beams and, depending on its intensity, can be used to kill cancer cells, to sterilize tissue grafts for burn victims, to sterilize food against insects or disease causing pathogens, to make insects sterile so they cannot reproduce, to induce desirable genetic changes in crops, or to scan body organs for abnormalities.



Human Health

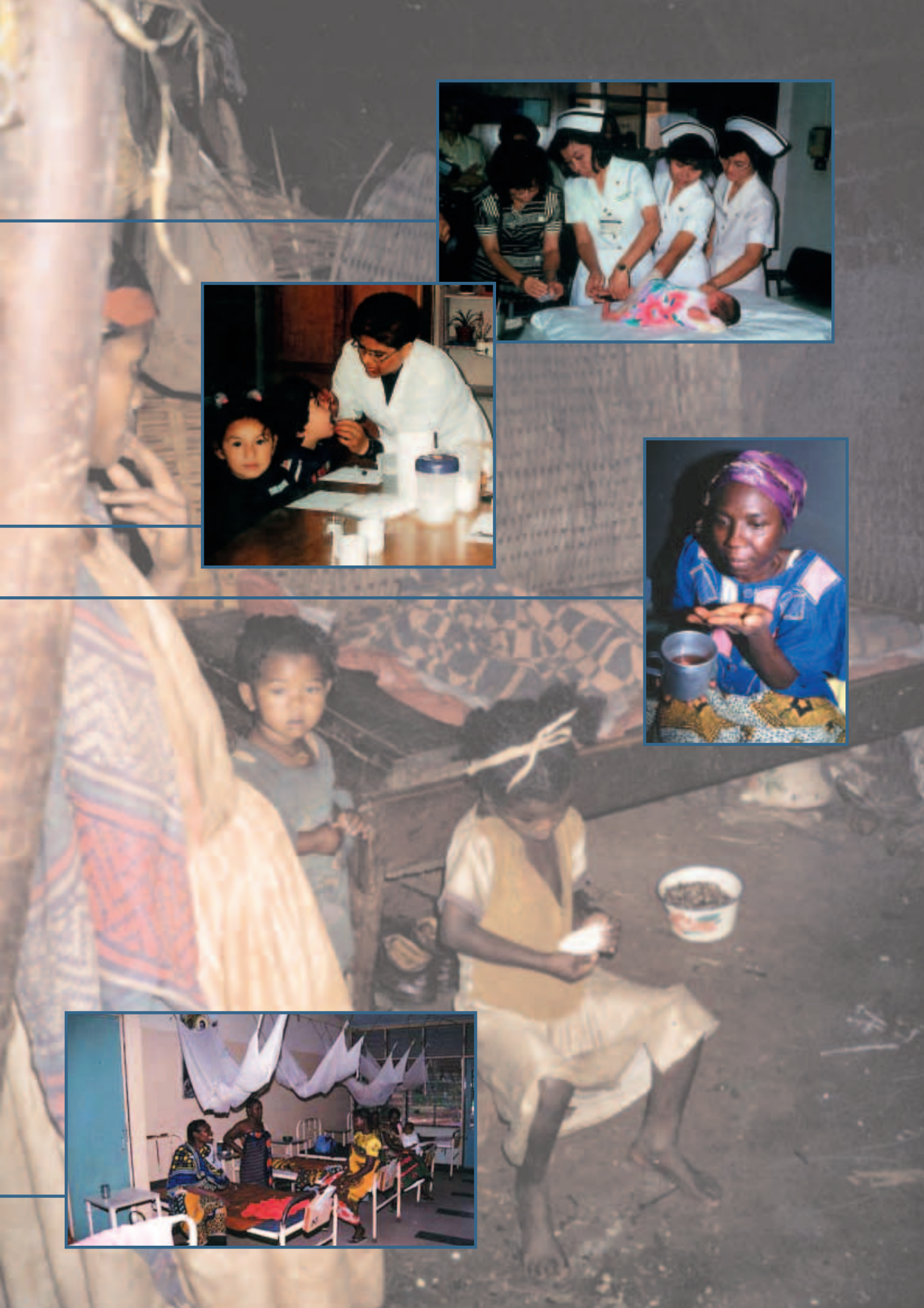
■ In developing countries, malnutrition, low birth weight, early childhood diseases, communicable diseases, and cancer are significant barriers to good health. The IAEA's activities focus on the use of nuclear technology to improve human nutrition and to prevent, diagnose and cure communicable and other diseases.


Malnutrition and hunger can have devastating consequences, contributing to low birth weight, developmental problems, mental retardation, and a weakened immune system. Supplementation programmes have been used for decades to improve nutrition in developing countries, where nearly 200 million children under 5 years of age suffer from malnutrition. The IAEA's nutrition programme uses nuclear techniques to monitor a wide variety of nutritional problems and improve the management of food supplementation programmes. In Latin America, roughly 80 million poor people in the region receive some nutritional support at a cost of billions of dollars to governments. An Agency regional project is providing the information needed to evaluate the effectiveness of these supplementation efforts and is assisting national governments to set baseline nutritional guidelines tailored to local conditions and needs. The Agency is also supporting research in Senegal to evaluate the effectiveness of a supplementation programme for breastfeeding mothers and children in poor urban areas.



Tuberculosis (TB) and malaria are serious threats to human health in the developing world. TB kills an estimated 1.5 million people each year. Malaria accounts for one in five of all childhood deaths in sub-Saharan Africa. The IAEA has developed molecular methods that are able to detect drug-resistant strains of both TB and malaria in a matter of hours, rather than the several weeks required by traditional methods. Several projects have been undertaken in Africa using these methods to detect drug-resistant strains, so that appropriate treatment can be started early. In Mali, molecular methods were used to rapidly identify more appropriate drugs to effectively control a malaria epidemic.

While communicable diseases continue to be a priority, the impact of other diseases, like cancer, in the developing world is not insignificant. The IAEA is working to improve access to radiation therapy in developing countries, where, for example, roughly 200 000 women die each year from cancer of the cervix. Treatment was not available in Ethiopia, where women make up about 70 percent of all cancer patients, until a radiotherapy centre was opened in 1997 with support from the Government and the IAEA. Another Agency programme in Africa is working to improve the safety and effectiveness of existing radiotherapy treatments in 19 countries and to introduce new and improved techniques at these facilities. The Agency has also been developing a new radiopharmaceutical to treat primary liver cancer. Thyroid disorders and iodine deficiency disorders affect growth and overall health and can jeopardize children's mental health. Nuclear techniques play an important role in preventing hypothyroidism and treating thyroid cancer and iodine deficiency. The IAEA has initiated a project in the Philippines to use these techniques to screen newborns for congenital hypothyroidism.





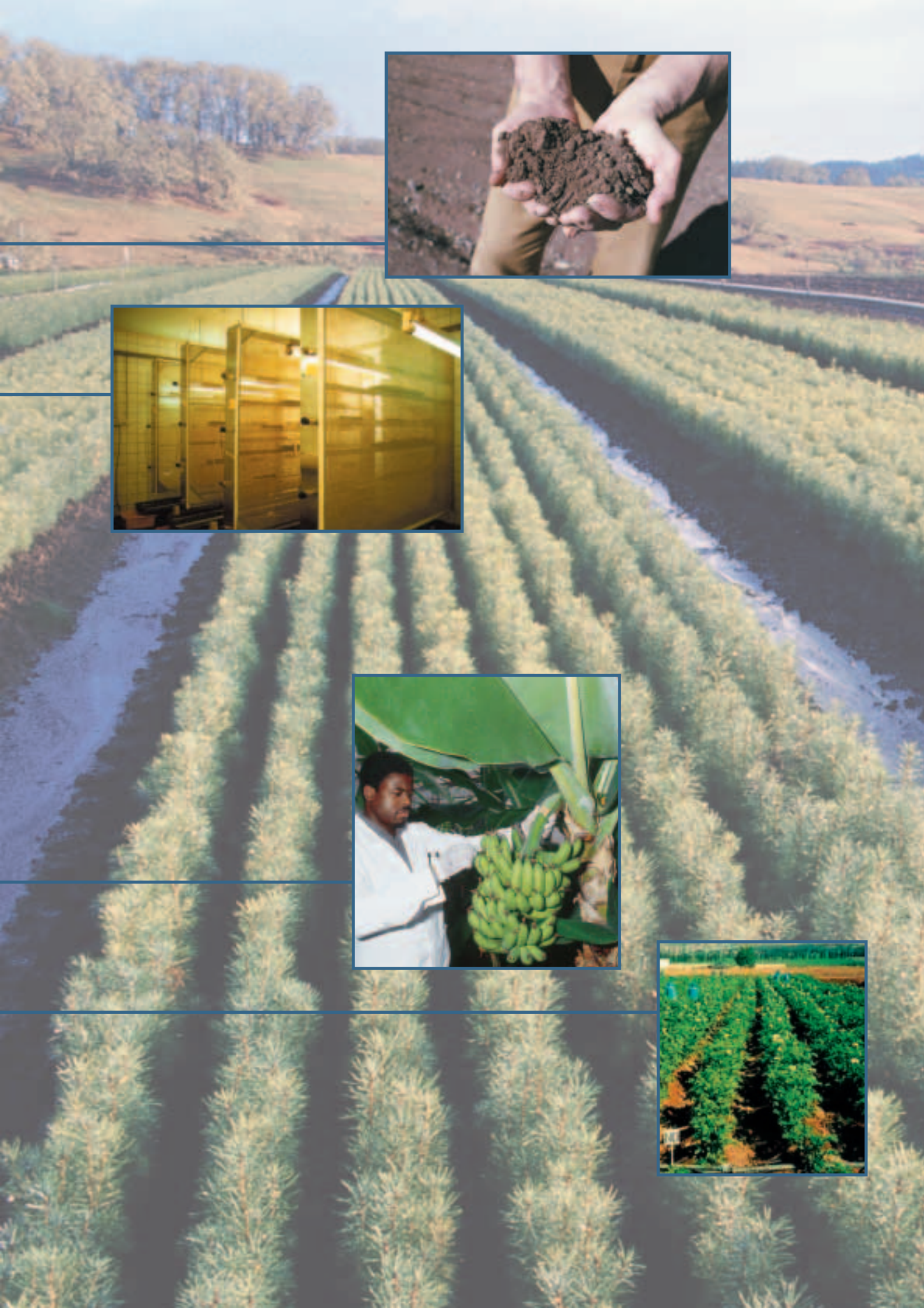
Food and Agriculture


■ Hand in hand with good nutrition and health is the availability of nutritious and affordable food. Although the climate in the poorest regions of the world is generally favourable to growing food, soil conditions, insect pests, and lack of water can severely affect crop yields. Jointly with the Food and Agriculture Organization, the IAEA supports the use of nuclear technology in developing countries to increase food production by combating insect pests, by improving crop varieties used, and by improving irrigation practices.

Insect pests can be controlled using the sterile insect technique (SIT). In SIT, male insects are first raised in the lab and then gamma radiation is used to make them sterile, so they cannot reproduce when released into the environment. The technique is being used successfully to combat the tsetse fly, the source of human sleeping sickness and the livestock disease nagana, in sub-Saharan Africa. SIT has also been used to control the medfly, a threat to some 250 species of fruit and vegetables. As a result, the medfly has been eradicated from Mexico and Chile, and from parts of Guatemala and parts of the United States. The programme is now being expanded into Argentina, Southern Peru, and the Middle East.

Radiation can be used to create subtle genetic changes in plants. The IAEA is at the forefront of this technology and has been successful in making commercial crops more resistant to disease or drought according to local conditions. A wide range of improved crop varieties, such as rice, wheat, banana, potato, yam and soya bean have been developed.

Agriculture accounts for the largest amounts of freshwater used in the world. In the face of growing demand for water world-wide, the efficient use of water in agriculture is a high priority. A method called fertigation can reduce wastage of water by supplying both water and nutrients (fertilizer) directly to the root zone of crops, maximizing efficiency. With assistance from the IAEA, eight West Asian countries participated in a five-year regional project, where nuclear techniques were used to evaluate the effectiveness of fertigation for a variety of annual crops.





Water ■ Today one in five people on Earth lack access to safe and affordable drinking water and, by 2025, more than half the world's population could be short of freshwater. An application of nuclear science called isotope hydrology can be used to assess sources of freshwater. This unique method can determine the age, movement, and conditions of water to help improve water management.

Several African countries are participating in an IAEA regional project to use isotope hydrology along with ongoing national water management programmes. In Latin America, the Agency is supporting the development and implementation of a sustainable groundwater management policy aimed at solving problems of water shortages and inefficient use of resources.


Another important source of water is making freshwater from salty seawater, a process known as desalination. The IAEA has been providing support to some Member States who are exploring the possibility of desalination powered by nuclear reactors. Interest in using nuclear power as a source of energy for desalination is growing, due to the increased demands for water, concerns about greenhouse gas emissions from fossil fuel plants, and the development of a new generation of small and medium sized nuclear reactors.

The use of salty water to irrigate salt tolerant crops is being studied in an IAEA project involving a number of developing countries. Thirty salt tolerant plants, from pistachio trees to barley, to Acacia, are being successfully grown using salty water. Nuclear techniques are providing critical information on the sustainability of this approach by helping to demonstrate that the source of water will not run out and by determining how to use it without building up more salt deposits.

Protection of the Environment ■ Quality of life is dependent on the quality of the environment. All life is affected by pollution and environmental changes. Marine pollution has a significant impact on the Earth's environment. Oceans provide high quality protein for a good portion of the planet's population and play a major role in regulating climate. Through its Marine Environment Laboratory, the only marine laboratory within the UN system, the IAEA is actively involved in protecting the world's oceans by using natural and man-made tracers to understand the dynamics of the seas and to monitor for potentially toxic contaminants.

The IAEA has worked with several regional organizations to improve their capacity to use nuclear techniques to monitor and assess marine pollutants, like heavy metals and pesticides. A project to enhance the capability of Black Sea countries to respond to serious pollution problems has been undertaken. New projects have been initiated to use nuclear techniques to rapidly detect toxicity in marine foods contaminated with toxins produced by harmful algal blooms.





Capacity Building

■ At the heart of the IAEA's activities is building local capacity through technology transfer. Working with its Member States, the Agency's role is to make sure that this technology can not only be used safely and effectively, but can also be locally sustained. This means providing training to develop local expertise and ensuring that any needed infrastructure is in place before technology is transferred. The IAEA provides a variety of services to help to ensure that users, patients, and the public are not overexposed to radiation. The Agency also develops safety standards for activities that use or produce radiation and verifies that nuclear technology transferred is solely used for peaceful purposes.

Building a sustainable future will also require affordable energy that does not harm the environment. Careful planning is required, if energy choices are to be sustainable in the future. The IAEA is the sole UN agency involved in overall energy planning and has a comprehensive programme to assist developing countries and economies in transition plan for their future energy needs. Under the programme, all energy options are treated equally. Planning models that consider all pillars of sustainable development — economic, environmental, and social — are tailored to national needs and training and data support are provided. The Agency also leads a multi-agency effort on indicators for sustainable energy development called for in Agenda 21 and provides support in a number of ways for countries that include nuclear power as part of their sustainable development strategies, recognizing that it broadens the resource base by putting uranium to productive use, reduces harmful air pollution and greenhouse gas emissions, expands electricity supplies, and increases the national stock of technological and human capital.

Providing affordable energy services in continuous sustainable manner may also require advanced and innovative nuclear technologies. Last year, the IAEA initiated a major international project to foster joint innovation in reactors and fuel cycles based on nuclear fission. The Agency also facilitates research on fusion. Using the same process that powers the sun and the stars, fusion could one day provide an essentially inexhaustible source of energy. The next and largest project will be an international collaboration to build an experimental reactor.

The road to a sustainable future must be built one step at a time. While science and technology offer many opportunities for progress, success will ultimately depend on people. Over the past four decades, the IAEA and its Member States have built a sound foundation of institutions and personnel in many developing countries that now provide an important regional resource — in terms of capabilities and expertise. As a result, developing countries are today better positioned to use nuclear science and technology to solve pressing developmental challenges: good health; sufficient food and water; and a safe environment.



The International Atomic Energy Agency & Sustainable Development

IAEA Director General Mohamed ElBaradei

Science and technology are playing key roles to help countries make strides towards the goals of sustainable development. Maintaining progress to overcome the major challenges of eradicating poverty, fighting disease, and protecting our environment depends upon sustained and cooperative action among committed partners.

The International Atomic Energy Agency is contributing to the world's collective efforts in essential ways. Through channels of technical cooperation involving longstanding and new partnerships, we are working to build up the scientific and technological capacities of developing countries, functioning as a catalyst for social and economic development. Many of our nuclear science and technology activities are related to applications serving basic human needs. They focus, for example, on the use of nuclear techniques and radioisotopes to increase food production, and to improve health care, manage water resources, and assess sources of environmental pollution. As we will report at the World Summit on Sustainable Development, for instance, since 1992, more than 800 Agency projects, valued at nearly \$400 million, have supported priorities related to agriculture, human health, water and other fields of sustainable development. These are above and beyond the Agency's extensive activities to build up capacities, particularly in developing countries, for overall energy planning for sustainable development.

As we move into the 21st century, there is growing awareness that far more needs to be done to raise and secure the quality of life for all the world's people, and that we need to use all the tools, resources, and expertise at hand. Where they hold comparative advantages, nuclear science and technology have become preferred solutions — and sometimes the only solutions — to many economic and social problems around the world. The IAEA will continue to work closely with its Member States so that these technologies are applied safely and efficiently for the benefit of the world's sustainable development.

To learn more about how nuclear science and technology are contributing to sustainable development, visit the IAEA's WorldAtom website www.iaea.org

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